



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : HING et al.
Appl. No. : 09/787,922
Filed : June 13, 2002
Title : FOAMED CERAMICS

Confirmation No: 8656

TC/A.U. : 1731
Examiner : C. Fiorilla

Docket No.: : HING3001/REF
Customer No: : 23364

REPLY BRIEF ON APPEAL

Commissioner for Patents
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Sir:

This reply brief is timely filed within the extended period for filing a reply brief which is now set to expire on April 15, 2004.

This is in response to the Examiner's Answer in connection with the above identified application in which the Examiner maintains the rejection of all the claims as obvious over the prior art. The Examiner's points in support of his rejection have been carefully considered but Applicants do not believe that the combined teachings of the references relied upon in the rejections render the claims on appeal obvious under 35 U.S.C. 103. Applicants maintain that these rejections should be reversed.

The Examiner notes on page 8 of the Examiner's Answer that the test for obviousness is not whether the features of the secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. In support of this, the Examiner cites *In re Keller* 208 USPQ 871. This decision has been reviewed and it is noted that the sole issue therein regarding the prior art rejections is essentially whether the references, taken collectively,

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would have suggested the use of digital timing in a cardiac pacer to those of ordinary skill in the art at the time the invention was made. In the decision it is stated that Walsh, which is a reference, discloses a heart stimulator used in the studies of atrioventricular conduction system of a mammalian heart. A stimulator used in studies of the atrioventricular conduction system of a mammalian heart is not so non-analogous to a stimulator used to pace a mammalian heart that it should be ignored. Thus the prior art in this decision was relatively close.

On the contrary and in the present case, the primary reference relates to porous refractory articles in general and in particular to the manufacture thereof. The presently claimed invention specifies a method of producing a synthetic bone material for use in biomedical applications, the synthetic bone material comprising a macroporous ceramic foam which has an open foam structure containing pores with a modal diameter $d_{mode} \geq 100 \mu m$. As noted on page 3 of Applicants' specification, there is a need for the development of a novel production route which allows control of the physical and chemical properties of the final product. This results in improved implants in terms of mechanical and biological performance, as a function of tailored properties and improved reproducibility. Thus, the claims on appeal are concerned with making a synthetic bone material for biomedical applications and there is no specific teaching of this in WO 93/04013, where there is only a passing teaching to "artificial parts for the body".

In response to Applicants' argument, the Examiner states in the Examiner's Answer that this argument is not persuasive as it is submitted the teaching of artificial parts for the body **encompasses** synthetic bone material. (Emphasis added.) However, this is not the issue on appeal, that is, it is not whether the prior art encompasses the claimed invention, as there is no anticipation rejection, but whether the teachings of the prior art as a whole render the claims on appeal obvious. Clearly, this is not the case as there is no motivation in the prior art to make the necessary selections to arrive at the subject matter of the claims on appeal.

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"A showing of a suggestion, teaching, or motivation to combine the prior art references is an `essential component of an obviousness holding" (quoting *C.R. Bard, Inc., v. M3 Systems, Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232(Fed. Cir. 1998)); *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617(Fed. Cir. 1999) ("Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references."); *In re Dance*, 160 F.3d 1339, 1343, 48 USPQ2d 1635, 1637(Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant); *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600(Fed. Cir. 1988) ("teachings of references can be combined only if there is some suggestion or incentive to do so.") (emphasis in original) (quoting *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933(Fed. Cir. 1984)).

The suggestion that the teaching of artificial parts from a diverse list of over twenty different porous articles teaches synthetic bone material for use in biomedical application is not the necessary showing and is clearly based upon Applicants' specification. Artificial parts for the body, without more, could include prosthesis and prosthetic devices such as an artificial hand, heart valve or artificial leg. The teaching of a synthetic bone material produced in accordance with the claims of the method on appeal is not suggested in a fair reading of the primary reference as it would be interpreted by one of ordinary skill in the art even in view of the exemplification of hydroxyapatite. The only such teaching requires the use of Applicants' specification, which impermissible hindsight.

In addition, the secondary reference to Oishi et al. clearly states as a technical field of the invention therein, that the present invention relates to a light-weight ceramic acoustic absorber used for the exhaust nozzle etc. of a jet engine which is light in weight and which has excellent resistance to thermal stress and excellent sound absorbing

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properties and also to a method of manufacturing the same. Thus, the facts of the case on appeal clearly and fully distinguishes this case from the facts in the Keller et al. decision relied upon by the Examiner in support of the obviousness rejection. Clearly, one of ordinary skill in the art would not combine the teachings of the references as urged in the Examiner's Answer, absent, Applicants' teaching as there is no suggested relationship between the ceramic acoustic absorber used for exhaust nozzles of a jet engine in the secondary reference and the artificial parts for the body in the primary reference.

The decision, In re Sernaker cited by the Examiner in the Examiner's Answer has also been considered. However, in this decision, the court overruled the Patent Office's rejection on the grounds of obviousness. There is no particular portion of this decision cited in the Examiner's Answer, although it seems that the appropriate portion deals with the fact that it is not necessary that prior art suggest expressly or in so many words changes or possible improvements, it is only necessary that the inventor apply knowledge clearly presented in the prior art. However, as just noted, such knowledge of a suggestion to combine the teachings of the prior art is not present in the prior art without relying on Applicants' teaching which is impermissible hindsight.

It is noted that on page 7 of the Examiner's Answer it is stated that it is well settled that a reference must be considered for not only what it expressly teaches, but also for what it fairly suggests and that the entirety of the reference disclosure, including unpreferred embodiments must be considered in determining obviousness. (Emphasis added.) This is precisely Applicants' point. However, when one considers the combined teachings of the references, there is no suggestion of a prima facie case of obviousness and the rejections should be reversed on appeal.

As recognized by the Examiner, none of the procedures described in the primary reference describe the use of a ball mill. The use of a ball mill is a claimed feature of the claims on appeal and it is an important aspect of the presently claimed invention. As noted in Applicants' specification the ball mill provides for obtaining macroporosity which

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is highly interconnected and a microstructure contains an interconnected network of micropores.

The Oishi et al. secondary reference clearly relates to a ceramic acoustic absorber which is light and has excellent resistance to thermal stress and has a large capability of absorbing noise and can withstand the gas jet from a jet engine. The inventors therein directed their attention to the fact that when a resistance to flow is increased, the acoustic absorptivity increases, and they succeeded in improving acoustic absorptivity by adding silicon carbide fibers without changing the bulk density, thereby controlling the net flow resistance substantially without changing the weight. The present invention therein is based on this novel knowledge.

The method includes the use of SiC whiskers. As noted at column 3 of the patent, in accordance with the present invention, a foamed slurry is produced by mixing an alumina based ceramic powder, SiC whiskers and a solution containing a dispersant, an organic binder and a foaming agent and this was mixed by a ball mill using a pot with a capacity of 200 ml to produce a foamed slurry. This is set forth at column 8. Clearly, there is no suggestion in this reference which would lead one of ordinary skill in the art to apply the use of a ball mill to a method of producing a synthetic bone material in accordance with the claims on appeal. Certainly not to make an artificial body part, much less a synthetic bone material for use in biomedical application in accordance with the claims on appeal.

On page 4 of the Examiner's Answer, it is urged that Oishi et al. disclose foaming a slip using a ball mill to produce a foam having pore sizes of 100-2000 μ m. However, there is no indication of location of this teaching in the reference. Interestingly, this range is a claim limitation from claim 27 on appeal! This is then used as a teaching to look for such a limitation in Oishi et al. This again is impermissible hindsight.

It is concluded that it would have been obvious to one of ordinary skill in the art at the time the invention to use this method of foaming in view of the generic disclosure to produce articles with the claim size. However, one of ordinary skill in the art would

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appreciate that the ball mill technique resulted in the composition having divergently sized voids. As stated at column 8 of the patent, the solution was mixed in a ball mill using a pot with a capacity of 200 ml to produce a foamed slurry. The foamed slurry was poured into dies, dewatered and the molded part was removed from the dies and the bulk density of the absorber product was measured and found to be 0.8 g/cm^3 . A section was cut through the absorber, and inspection showed that there were voids with diameters in the range of 10-500 μm near the front surface and the diameters became larger toward the rear surface. In the center there were voids with diameters in the range of 1000-3000 μm and in the proximity of the rear surface, voids with a maximum diameter of 5000 μm were found. Clearly, this divergent array of pore size does not suggest the modular pore size in the range of from 100-2000 μm as set forth in claim 27 on appeal. Similarly, the bulk porosity of from 40-95% and a strut density in the range of from 60-95% as set forth respectively in claims 25 and 26 are not suggested by the prior art.

The Wu reference does not overcome the deficiencies discussed above with respect to the primary reference and Oishi et al. It is urged in the Examiner's Answer that Wu discloses the use of alumina media having a 12.7 mm size for use in a ball mill with reference to column 5, lines 33-34. It is concluded that it would have been obvious to use this ball mill size in the process of the primary reference. Again, the Wu reference relates to a method for improving the properties of ceramic green bodies. In particular, ceramic green bodies having improved green strength are provided. Incorporating certain acid-containing polymers as binders at a level of at least 1-15%, preferably at least about 3 to about 10 percent by weight based on the weight of the ceramic properties improves the green strength of the resulting ceramic bodies.

The ceramic mixture of preparations is discussed at column 5 wherein it is stated that ceramic mixtures were prepared in the following manner: to a 00-ball mill jar was added 100 grams of alumina grinding media (approximately $\frac{1}{2}$ inch x $\frac{1}{2}$ inch cylinders). These are used in the formation of ceramic materials which are used to prepare

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lightweight, strong, thermally and chemically resistant products useful as chromatographic media, grinding aids, abrasives, catalysts, absorbents, electronic components, construction components and machine components. Again, this in no way relates to the presently claimed method for providing a synthetic bone. The necessary motivation to make a selection from each of the references relied upon is only found in Applicants' disclosure and this is impermissible hindsight. Accordingly, this aspect of the rejection should be withdrawn.

Reliance on the Nukada et al. reference is improper as it was raised only in the final rejection, and was not necessitated by any amendment to the claims. It is not cited on a form PTO 892. In any case, Nukada et al relate electrophotographic photoreceptor and production process thereof. It does not relate to artificial parts for the body or even green bodies and the necessary motivation for the combination is not found in this reference. Nukada et al. discloses the use of alumina and zirconia media having 1-30mm size for use in a ball mill. However, there is again no motivation to select this particular size and utilize it as in the present invention. There is no motivation to make the necessary combination other than that contained in Applicants' specification. The only argument in support of the rejection is related to the generic teaching therein. As noted by the CAFC, In re Kotzab 55 USPQ2d 1313(Fed Circ. 2000) particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. (Emphasis added.) Applicants most respectfully submit that conclusionary statements such as those relied upon are insufficient to establish the necessary motivation and the rejection should be reversed.

As previously noted, there is no positive teaching in the primary reference of the open pore structure which is a claim limitation of all the claims on appeal. The argument is stated not to be persuasive since the primary reference states that the pores may be closed and/or the porosity may be open at page 11. However, this simply suggests to one of ordinary skill in the art various alternatives. It is not a positive teaching and the

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only such teaching is present in Applicants' specification. The use of such a teaching is impermissible hindsight. Thus, this aspect of the rejection should not be sustained on appeal.

The Examiner argues in the Examiner's Answer that it is recognized that the primary reference teaches the forming or gas entrapment can be carried out by mechanical means. It is agreed by the Examiner that the primary reference gives examples including stirring and using a Buchner funnel but the primary reference is not limited to the use of the exemplary methods. However, there is no motivation to look to the teachings of the secondary reference which as has been repeatedly emphasized, is directed to the formation of a lightweight ceramic acoustic absorber for use with jet engines. Thus, the only such motivation to combine the teachings relies upon Applicants' specification. In order to achieve the results substantiated by the rejection, there must be some motivation.

While it is urged in the Official Action that it is well settled that a reference must be considered for not only what it expressly teaches, but also for what it fairly suggests and that the entirety of the reference disclosure, must be considered. However, when one of ordinary skill in the art considers the teachings of the secondary reference, the only fair and reasonable interpretation is that it relates to lightweight ceramic acoustical absorbers. Clearly, this combination of references is not sustainable on appeal.

It is stated on page 8 of the Examiner's Answer that the motivation to combine the references need not suggest arriving at the claimed invention. If, the motivation does not arrive at the claimed invention on appeal, how can the claimed invention be considered obvious from the teachings of the prior art? The clear inference is that the prior art relied upon by the Examiner does not in and of itself, as would be interpreted by one of ordinary skill in the art, fairly suggest the claimed invention. It is only as the result of hindsight and the use of Applicants' specification as a template to locate in the prior art the essential features of the claimed invention, that the invention can be

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considered to be obvious. Such hindsight is improper and the rejection should not be sustained.

As noted in the appeal brief, the only disclosure in the primary reference to the use of a binder is at page 9 which simply suggests that binders such as resins may be included but there is no suggestion of the specified amounts which are clearly indicated to be preferred embodiments of the presently claimed invention. As discussed at page 20 of Applicants' specification, the results in Table 3 and Figures 7-10 demonstrate how variation in the ratio of ceramic particulate to binder solution variation in both the bulk density and the strut density. The sintered mill-foamed porous ceramics prepared with the greater volume of liquid carrier have the lower bulk and strut density reflecting a more open structure. It is recognized on page 10 of the Examiner's Answer that the reference is silent with respect to the amount of binder. It is stated that the amount of binder is left to be determined by one of ordinary skill in the art. However, this is an obvious to try standard and the determination of the specific particulate surface area, ingredient amounts and firing temperatures would have been well within the realm of routine experimentation to one having ordinary skill in the art at the time of the invention. However, as has been repeatedly emphasized, the primary reference is simply related to ceramic materials which include artificial body parts. There is no suggestion of the specific formation of a synthetic bone material as required by the claims on appeal. Where is the motivation in the prior art relied upon in the Official Action to form such a product, especially in view of the unique combination of properties of the presently claimed process formed by the method of the claims on appeal?

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In view of the above arguments, the rejections of the claims on appeal should be reversed. The application should be passed to issue.

Respectfully submitted,

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